Exploring the Concepts of Immersion and why Headphones Enhance the Player Experience in 21st Century Online Competitive Video Games

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Copyright statement

Abstract

Progressions in mobile and console gaming, the accessibility of online gaming, and the current universally unpredictable political/economic climate (Collins, 2013) have made the virtual worlds more appealing for players that desire to escape the everyday. "We're living in the age of experience. And while everyone is still obsessing over millennials, because half the world's population is under 30, we need to start thinking about the iGen – the generation born with mobiles in their hands" (Jordan and Marshall, 2017). This thesis investigates the role of sound in shaping immersive player experiences and how headphones are used to enhance immersion in 21st century massively multiplayer online and virtual reality video games. It explores scholarly research on the concepts of immersion to recognise why sound is a critical feature in the gameplay experience today.

The research in this thesis contains an online research study that aims to reveal why video game players use headphones to augment their state of immersion during gameplay experiences. The survey includes answers from 59 respondents and contains quantitative and qualitative data. The quantitative results from each question are analysed individually, and comparisons between responses are extracted to understand the effects of using headphones to augment the player experience. The qualitative data is unpacked in the form of a discussion that draws conclusions from the experiences respondents encounter when using headphones during gameplay.

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Acknowledgements

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1. Background and Context

As an observing member of the gaming community, I have developed an interest that aims to investigate immersion and the impact that it can have on the player experience today. My early attention addressed the behaviour of players interacting with diegetic sounds that can encourage, enhance, and maintain immersion in massively multiplayer online video games, which turned to an understanding of how immersion may be influenced depending on the audio device an individual chooses to listen to the virtual world through.

Headphone unit sales in the last five years have increased from 236 million in 2013 to an estimated 368 million in 2017 (Statista, 2017), and headphone usage in gameplay is also on the rise, particularly since the release of massively multiplayer online battle royale video games such as *Fortnite* (2017) and *PlayerUnknown's Battlegrounds* (2017) (Yin-Poole, 2018). Headphones can reduce sounds from the external environment and allow the player to interact with binaural sounds (three-dimensional audio) that can enhance the immersive experience, as Guitierrez-Parera and Lopez (2016) state, "The reproduction of binaural sound over headphones uses the principles of the human auditory system. It assumes that, if we are able to reproduce in the listener's ears with headphones the same pressures that the listener experiences in a natural environment, a realistic acoustic immersion can be simulated" (pg. 1). However, headphones are generally selected by the player for inferior purposes such as containing the sounds for an isolated listening experience, in addition to the benefits of portability. Furthermore, 3D headphones provide a portable alternative to surround sound

home setups that can be expensive, require a lot of cable management, and take up room (DNA, 2016).

In 1995, Shuker described that video games were, “a major cultural form and may well soon replace cinema, cable and broadcast television as the dominant popular medium.” Today, video game consoles permit users to experience all forms of media through one machine, and in the future, it may be possible that all forms of media can be in experienced in one video game; a true virtual world, as expressed in Ernest Cline’s science fiction novel *Ready Player One* (2011). Video games are designed to be immersive, engaging and entertaining, and some players report feeling so involved in another world that they forget about their immediate surroundings (Jennett, Cox, Cairns, Dhoparee, Epps, Tijs, & Walton, 2008). Chung and Gardner (2012) explain, “clearly, the *media content* of computer games has the potential to be highly *involving*, and it is reasonable to study how a highly involving computer game can potentially transport players away from reality”. Baudrillard (1997) considers the virtualisation of society to be of concern, stating,

> If the level of reality decreases from day to day, it’s because the medium itself has passed into life, and become a common ritual of transparency. It is the same for the virtual: all this digital, numerical and electronic equipment is only the epiphenomenon of the virtualisation of human beings in their core (pg. 30).

As virtual reality technology advances, virtual worlds are becoming widely accepted extensions of reality, and there are likely to be more significant questions surrounding the ethics of video games where content may be questionable with regards to the psychological effects that they may have on consuming users. Bowman and McMahan (2007) explain that due to a greater sense of presence in VR, “many successful applications of immersive VR

depend on high-fidelity sensory stimuli with the goal of producing a realistic experience that effectively places the users in the simulated environment" (pg. 37). Virtual reality systems enhance the visual presence a user may experience (Slater and Wilbur, 1997), and virtual reality industries encourage individuals to use headphones for a greater audible sense of presence to attain the full immersive experience (Tse, Jennett, Moore, Watson, Rigby, and Cox, 2017). Sound is receiving significant investment, leading to increasingly intelligent applications within adaptive audio, though also to sustain immersion and enhance emotional involvement (Grimshaw, 2011), as Vorderer and Bryant (2006) reveal, "there have been great improvements in both the audio tools for designers and composers and the possibilities for storage and playback" (pg. 245). This has been witnessed in the progression of the gaming engine *Unreal*, announced in 1998, which today demands the requirement for authentic sound design; something that has become a prominent feature in the psychology of computer game development, where interactive and adaptive sounds permit the developer to have more control over the mood and the player experience (Marks, 2009).

As suggested by Yin-Poole (2018), changes in gaming behaviour may be contributing to the observable increase in headphone sales. For instance, in the last two decades, and more recently evident in games *Fortnite* (2017) and *PlayerUnknown's Battlegrounds* (2017), some video game developers have progressively orientated their gamer market to accommodate the lone-wolf player experience, and immersion has become a paradoxically popular individual experience; playing alone at home while socially connecting through the internet with other online gamers. The persistent rise in gaming culture is largely expressed through the internet for passionate gamers to socially connect via online forums, such as *Reddit* (2005-2018), to discuss what improvements they would like to see in the future development of a

video game. With a gradual transition to transparency in today's society, there is a great responsibility for video game developers to deliver what the players request. If player requirements are ignored, players will choose to no longer consume the media experience, increasing the likelihood for game developers to lose their audiences and decline. Therefore, binaural sound recordings and headphone use may now be a greater priority for video game developers aiming to intensify the immersive experience and satisfy their existing players.

2. Literature Review

2.1. Why Study Video Games?

Persistent growth in the gaming market enables game developers to dedicate large production budgets, allowing for the improvement of graphics, game mechanics, and sound design, in addition to memory storage and hardware/software improvements, permitting the creation of expansive virtual worlds and increasingly realistic visuals (Collins, 2008). Previous technological limitations concerning early video game consoles constrained video game developers, forcing them to release the gaming media experiences in complete form. For instance, *Sonic the Hedgehog* (1991) is a game that has a beginning, a middle, and an end. The game is over when the last level has been completed, and the player can choose whether they wish to repeat the same experience an unlimited number of times. Today, however, the success of massively multiplayer online video games such as *PlayerUnknown's Battleground* (2017); *Fortnite* (2017); *Heroes of the Storm* (2015); and *Pokémon Go* (2016), are extended as they evolve, prolonging their lifespans with the integration of patches and updates that gradually refresh the player experience; as witnessed in the continued interest of *RuneScape* (2001). The magnitude and complexity of these games today makes the final product philosophy a rarity; endorsing the release of early access video games that embrace an endless to-do list at the cost of micro transactions, accommodating the consumer market.

According to Frasca (2001) the broadest definition for video gaming is, "any form of computer-based entertainment software, either textual or image-based, using any electronic platform such as personal computers or consoles and involving one or multiple players in a

physical or networked environment". Video games are determined by a set of rules that provide users with boundaries to play within, which creates order and encourages players to accept the virtual worlds and explore the virtual environments to realise the objectives to complete the game (Suits, 1978, pg. 34). However, in *PlayerUnknown's Battleground* (2017) there is no way to complete the game, which extends the rule-based objective to urge players to become the best player they can possibly be, competing against other players online globally. This behaviour typically occurs in the comfort of the player's home, although professionally organised events such as eSports now allow professional gamers to play competitively, seeing the global audience increase from 204 million to 292 million between 2014 and 2016 (Stevens, 2018).

Huizinga (1995) discusses the characteristics of play and states,

> we might call it a free activity standing quite consciously outside "ordinary" life as being "not serious", but at the same time absorbing the player intensely and utterly. It is an activity connected with no material interest, and no profit can be gained by it. It proceeds within its rules and in an orderly manner. It promotes the formation of social groupings which tend to surround themselves with secrecy and to stress their difference from the common world by disguise and other means (pg. 13).

The profit predominantly obtained through playing video games today is experience, and players can encounter virtual adventures that enable them to discover more about themselves through their actions in the virtual world. Wirman (2009) believes that video games are better understood as platforms of experience than as products to consume, which is similar to the experience of reading a book, since many video games incorporate some form of narrative. However, there is often no narrative present in massively multiplayer online video games and players are likely to assume their own narratives during gameplay (Ryan,

2001). Ryan reveals that individuals create their own narratives when involved in immersive experiences such as gameplay, which are interpreted experiences coming into our brains as stories to form memories and reveal more about the surrounding environment (Jorden and Marshall, 2017). The mind is totally engaged in the present moment during immersion, therefore immersive experiences are more likely to be remembered than non-immersive experiences. Furthermore, video games are more than just an act of playing, they are, "a source of memories, dreams, conversations, identities, friendships, artwork, storytelling and so much more" (Crawford, 2012, pg. 143), which could explain why video gaming is a culture of its own. Furthermore, it could also be argued that massively multiplayer online video games permit individuals to escape reality with others that are seeking to do the same, causing players to be more inclined to socially connect.

Video games have the potential to engage children in education, and can offer individuals a form of identity, along with a variety of conversational topics that they may choose to discuss with other players, and discover new friendships (Crawford, 2012). Games are largely thought to be a children's medium and are considered to be trivial activities that individuals will eventually outgrow, which discourages research concerning the impact of playing video games and unfairly compares them to other forms of media (Newmann, 2013). However, when observing the streaming service *Twitch* (2011) it is today apparent that video games are no longer only for children. Over 50% of the *Twitch* streaming content in the US is performed by male and female adults between the ages of 21 and 35 (Statista, 2015), and 55% of Twitch users are believed to be between the ages 18 and 34 (Twitch Advertising, 2017). Newmann suggests that there are three main reasons why research regarding video games should be approached seriously, which are, "the size of the video games marketplace; the popularity of

video games; and video games as an example of human-computer interaction" (pg. 3). Additionally, Koster (1999) argues, "the public already discusses and treats games as an art form, and uses the same standards of judgement for them as they do for films or novels or any other artistic medium". Ludologists claim that the interactivity a player may experience in a video game is different to other forms of consumed media because the player has more control and chooses how to present the avatar in the virtual world (Crawford, 2012). However, Crawford reminds researchers that though video games may typically be more involving than television, they are not as interactive as face-to-face conversation. Nevertheless, it may be debated whether face-to-face conversation will one day be replicable within advanced virtual reality systems because there will be a greater sense of presence that causes the user to feel inside the virtual world, meaning social interactions in gaming environments could be similar to those that are experienced in reality, as witnessed in the progression of *VR Chat*. As Biocca and Delaney (1995) observe, "with a [headset] the viewer ceases to be a voyeur and comes closer to being an actor in the visual world" (pg. 68).

There are similarities in the ways consumers are affected by all types of media content they experience, though as Crawford (2012) reveals, their differences, "have been somewhat exaggerated in an attempt to distance video game scholarship from disciplines such as cultural, literary and media studies" (pg. 7). However, Walkerdine (2007) suggests that video games are to be studied independently due to the level of interactivity that is required as the player is controlling and participating in the actions on-screen. The ongoing observable advancements in VR technology are signifying that these gaming experiences will be vastly different to how we perceive them today, particularly if, or when, virtual reality attains the

goal of creating visual and audible virtual worlds indistinguishable from what we now call reality. Therefore, the necessity to investigate an alternate reality is imperative.

2.1.1. Virtual Reality Interests

Ryan (2001) defines virtual reality (VR) as, "a computer-generated three-dimensional landscape in which we would experience an expansion of our physical and sensory powers; leave our bodies and see ourselves from the outside" (pg. 1). VR technology is believed to be an immersive and interactive experience produced by a computer (Pimental and Teixeira, 1993), and it was originally used by the military to enable troops to train in a safe computer-generated environment (Bowman and McMahan, 2007), providing players with an extended body that can be used to interact in a virtual world (Collins, 2013). VR intends to connect players to a simulated reality, which may be similar to the reality we experience today with neurobiology research suggesting that our current observations of reality are limited (Ryan, 2001) (Grau, 2003). According to Zhai (1999),

> Virtual Reality starts out as a medium just like television or computers or written languages, but once it gets to be used to a certain degree, it ceases to be a medium and simply becomes another reality that we can inhabit (pg. 184).

In today's Western societies, technology is accepted as part of reality because humans are emotional beings that will form companionships and attachments when interacting with machines, which will inevitably have some emotional effect (Grimshaw, 2011). When playing video games, virtual reality headset users have the ability to interact within a virtual world similar to how they would in reality, which increases their potential to experience total engagement, emotional involvement, and ultimately, immersion. Crawford (2012) explains,

“we live in an increasingly narcissistic and ‘performative society’ where individuals will draw on media (including video games) as a ‘resource’ in constructing their social performances, such as informing the way they dress, speak and act” (pg. 81). Players will sometimes perform the personality of a computer-graphic avatar and absorb themselves in the selected identity, which is predominantly expressed in massively multiplayer online video games by players performing the avatars they control (Wright, Boria, and Breidenbach, 2002). These kinds of games are reputation games, in which players dress up their avatars and flaunt unlockable items to other members of the public (Collins, 2013). Performances of virtual identities are today witnessed in *VRChat* (2017), which is a virtual reality video game that permits players to interact with their chosen avatars in a virtual world involving no observable objectives. It provides a platform allowing users around the world to socialise via voice chat while controlling visual elements of their characters to accompany their character performance, therefore the enhanced experience of presence generated by the virtual reality headset can be universally enjoyed with other online players (Newmann, 2013). Crawford concludes that, “in a rapidly changing and liquid world, fixed identities become less useful, and so identities become ever more fluid.” (pg. 83).

VR embodiment is the sense of being that enables individuals to perceive, experience, and interpret the virtual worlds around them subjectively, often assuming the identities of virtual avatars, which allows players to observe their actions from the outside looking in (Slater and Wilbur, 1997). As Biocca and Delany (1995) explain, “with a [headset] the viewer ceases to be a voyeur and comes closer to being an actor in the visual world” (pg. 68). Ihde (2002) identified three types of embodiment: sensory; cultural; and technology. Sensory embodiment is the physical experience of the world, cultural embodiment is the social

belonging to the world, and technology embodiment refers to extension of the body by exercising technological tools (Collins, 2013). However, Hillis (1999) claims that players attaching themselves to extended bodies on virtual adventures may have the responsibility of one too many bodies. In reality, the player's body suffers, "hunger, corpulency, illness, old age, and ultimately death", whereas in the virtual world, "the chosen body, an electronic avatar decoupled from the physical body, is a program capable of enduring endless deaths" (pg. 207). It may then be considered that there is a disembodiment from the real world to the virtual world when immersed players are transported to a virtual reality. To conclude, Ryan (2001) states that,

> In this world of our creation we would take on any identity we wished, but our virtual body would be controlled by the movements of the real body, and we would interact with the virtual world through physical gestures. The computer would keep track of all our past actions and creations, and since time spent in the system would a significant part of our lives, these digital archives would become a substitute for memory. We would be able to relive earlier experiences by simply rerunning the software (pg. 49).

Pimentel and Teixeira (1993) state that virtual worlds are not required to replicate reality to provide a realistic experience, and that the fictional world only has to be real enough for players to temporarily absorb themselves inside another reality, which they argue is, "the same mental shift that happens when you get wrapped up in a good novel or become absorbed in playing a computer game" (pg. 15). Baudrillard argues technological limitations will prevent VR from generating a perfect duplicate of reality. However, Ryan (2001) suggests, "what if VR were perfectly realised? Would we spend our entire lives inside a Disneyland of digital data? Would images become our world? How would we tell the difference between

simulation and reality? If we could not do so, would this mean that simulations *had become* reality – or alternatively, that reality was a simulation?" (pg. 32).

2.2. Sound Impacting Player Emotions

The pinball machine, arising from the early nineteenth century *Bagatelle* table, is one of the earliest examples of sound in electronic gaming, which consists of bells and buzzers to captivate players (Collins, 2008). These rewarding sounds are used to trigger emotional responses that cause players to maintain longer durations of engagement, resulting in more money being spent. The anticipated rewards function as positive reinforcements, which Flora (2004) states as occurring when, "an event or stimulus is presented (positive) as a consequence of behaviour and the behaviour increases (reinforcement)" (pg. x). For instance, a pinball machine's stimulus consists of pleasing bell/buzzer sounds (positive), and if the continuation of play delivers further rewarding sounds (reinforcement), then playing for longer durations has been positively reinforced by the rewarding sounds. Sounds are predominantly used to induce emotions, and players may often use previous life experiences to respond to stimuli independently, permitting unique interpretations and triggering a range of emotional responses. Donnelly, Gibbons, and Lerner (2014) argue, "the music for arcade games appears not very interactive by more recent standards. It was just a presence, rather than being defined by gameplay" (pg. 153). Arcade music became associated with the aural architecture of arcade venues and became part of the experience (Blesser and Salter, 2009), which established audible familiarity for consumers entering the venues; similar to what we may expect from main menu music in almost all video games today that typically set the tone for the awaiting gameplay experience.

Due to technological limitations at the time, music became a critical feature and was used continuously in early video games, particularly for Nintendo 64 video games during the early 1990's that aimed to sustain immersion for as long as possible. Using music during travel time in video games, from one destination to another, replicates the sense of adventure music produces in reality. Leman (2008) states, "music thereby offers the proximal sonic cues and engages us to move along with the distal action that could have produced these cues" (pg. 97). It is apparent when traveling via public transport today that many individuals on their journeys listen to music through headphones or earphones, which may be used to evade the monotony of everyday routines, enabling their minds to enter a state of flow (Csikszentmihalyi, 2014). Leman (2008) also explains that music, "may contribute to mental order, and the general effect is happiness, consolation, and well-being" (pg. 4). Listening to personalised music playlists through external speakers on public transport is generally avoided, and individuals that become accustomed to listen to sound through headphones may be more inclined to listen to sounds in other forms of media, such as video games, the same way. Donnelly, Gibbons, and Lerner (2014) report that music is used in gameplay to,

> quicken the emotional state of the player and it works best when used least. If music is constantly playing it tends to become sonic wallpaper and loses its impact when it is needed to truly enhance some dramatic component of gameplay (pg. 125).

When music is not present, the absence of audio allows a player to discover unobtainable knowledge about themselves through self-reflection based on their actions in the video game (Donnelly, Gibbons, and Lerner). The movement for game developers to not include music during gameplay is progressing in massively multiplayer online video games such as

PlayerUnknown's Battlegrounds (2017); and is only reintroduced when the player departs the gameplay action. This is because music can be distracting for a player seeking to listen out for footsteps, gunshots, and other diegetic sounds, permitting them to make sense of their surroundings, focus on external threats, and potentially improve their gameplay performance. The lack of music in these games makes them more involving because the player is required to pay close attention to the diegetic sounds they can hear around them. Donnelly, Gibbons, and Lerner (2014) conclude, "the players are required to search for a way out by confronting horrific enemies that they have spent significant amounts of time listening to and trying to avoid" (pg. 140), or perhaps, enemies that they have been pursuing. In these instances, the player uses their auditory spatial awareness to enable them to process and decode incoming sounds that affect their state of mind consciously or unconsciously (Blesser and Salter, 2009). Therefore, "the separation of sound from source allows mental imagery to dominate the listener's mind" (Collins, 2013, pg. 25), for example, research into spatially rendered audio-based video games suggests that listeners can mentally visualise a game's physical space regardless of their visual ability because the audio allows a player to create a mental space that establishes boundaries to play within (Collins). Furthermore, incoming sounds triggered by enemy players often signal events that are taking place, as well as events that are not taking place (Blesser and Salter). In *PlayerUnknown's Battlegrounds*, listening to enemy fire in the distance informs the listener that a battle is underway, and silence informs the listener that no other players are in proximity, or that other players are hiding in proximity, which can be both comforting and/or unnerving for the listener.

Grimshaw (2008) explains,

> visuals and sound are often used to elicit specific emotions among the consumers of computer games. Currently, however, the computer game industry is focused on the quality of the graphics within the game. The computer game industry has clear guidelines for visuals, but not particularly for sound. Yet, sound is as least as important, if not more important, than visuals for evoking emotions (pg. 177).

Collins (2008) suggests that unlike other forms of media where the audience is a passive receiver of audio, video games require players to independently play the role of a transmitter, triggering the timings of certain sound events that guide players through a game narrative. Non-diegetic music is predominantly used to enhance the overall structure of gameplay for the player experience and is likely to trigger certain emotional responses associated with the mood of the music. As Luck (2014) states,

> one of the key reasons people engage with music, whether as listener or performer, therapist or researcher, is because of its emotional impact. Music comforts us when we're sad, lifts us up in happier times, bonds us together. We use music to modify our mood, augment current feelings, release tension (pg. 255).

Likewise, sounds in video games can achieve the same affect. Once players become immersed in a virtual world they find it more difficult to differentiate between fantasy and reality, often causing individuals to react to diegetic sounds similar to how they would in reality (Grimshaw, 2011). For instance, the sound of a demonic creature is likely to cause players to show signs of distress, leading to an increase in alertness and concentration. These scenarios permit sound designers to carefully select, exaggerate, or understate sounds depending on the emotional state they wish to achieve so that the emotional narrative in the game is executed appropriately.

In everyday listening, we retrieve disorganised and unpremeditated sounds from the observable world through our ears, which the brain decodes to provide information about the sound source and its significance at that present moment (Chion, 1990). Humans perceive the world indirectly because the human listener is required to decode the sound to form new ideas (Collins, 2013). Blesser and Salter (2009) explain,

> listening is an important human activity just because it creates an intimate connection to the dynamic activities of life, both human and natural. In fact, from a psychological perspective, we do not so much hear sound as perceived sonic events, with sound transporting events into our consciousness (pg. 15).

Sound designers are largely aware that the audience/viewer can be deceived by sound to augment the visual object or event in a video game, however, the cognitive process used to decode sound is complex and is not completely understood (Blesser and Salter). For instance, there is a supposed difference between hearing and listening; hearing sound is involuntary, whereas listening to sound is a conscious choice that increases an individual's likelihood to engage and learn (University of Minnesota Duluth, 2011). As Collins (2013) reveals, "listening affects the ways in which the player experiences the game and, in some cases, affects the player's ability to play the game" (pg. 5).

Michel Chion (1990) identified 3 modes of listening: casual, semantic, and reduced. Casual listening is stated to be the most common where, "we hear what we expect to hear even if it is not actually represented in sound, and we do not hear what we do not expect" (Blesser and Salter, 2009, pg. 182); and it refers to sounds that have an identifiable source (Vorderer and Bryant, 2006). Semantic listening is the process of decoding the symbolic attributes a sound

contains, which enables the listener to construct a narrative to understand the ideas and actions that they are required to present next. Therefore, the listener receives the code and not the sound. Lastly, reduced listening attends to a sound independent of its context and excludes visual depictions associated with the sound source (Vorderer and Bryant) (Blesser and Salter). In summary, Vorderer and Bryant (2006) explain that,

> in video game music, reduced listening would emphasise the mood of the music, casual listening would highlight the actions that trigger certain sounds/loops, and semantic listening would focus on the lyrical or genre-related connotations of audio (pg. 244).

Additionally, a player's mode of listening may be dependent on whether the player's skills can match the skill requirements necessary to successfully play the video game. For example, new players are initially required to aurally familiarise themselves with the virtual world they are playing within, which allows them to create an archive of sounds at the same time as distinguishing the sorts of sounds that are important to improve their gameplay performance. Therefore, a new player may listen to gameplay sounds casually, whereas an experienced player may listen semantically.

2.3. Immersion in Computer Game Sound

Immersion is an individual, adventurous and exhilarating experience that can be intellectually stimulating and mentally absorbing (Ryan, 2001). It is a process that alters the perceiver's state of mind and transports individuals away from their immediate reality (Grau, 2003), which Jennett, Cox, Cairns, Dhoparee, Epps, and Walton (2008) state is, "critical to game enjoyment, immersion being the outcome of a good gaming experience. However, although

there seems to be a broad understanding of immersion in the gaming community, it is still not clear what exactly is meant by immersion and what is causing it" (pg. 641).

Brown and Cairns (2004) gathered qualitative data by interviewing several participants to investigate how players identify immersion. Their findings revealed that the term immersion is used to describe the involvement a player has with a video game, which changes depending on the level of engagement. Three phases of immersion were identified: (1) *engagement*, players learn to control the game environment; (2) *engrossment*, the game controller becomes virtually invisible to the player as their emotions begin to interact with the activity; and (3) *total immersion*, the player becomes disconnected from reality and provides their highest level of attention. When the player reaches total immersion, they become attached to the gaming environment and identify with the avatar they control, therefore, they are more likely to be affected by gameplay sounds and the adventures experienced (Grau, 2003). Jennett, Cox, Cairns, Dhoparee, Epps, and Walton (2008) describe immersion as an experience where,

> the game is so engaging that they [the player] do not notice things around them, such as the amount of time that has passed, or another person calling their name. At such moments, almost all of their attention is focused on the game, even to the extent that some people describe themselves as being in the game (pg. 641).

Research on textual immersion can assist to recognise the impact of immersion during gameplay on individuals that are engaged with the narrative. Ryan (2001) describes that, "the reader plunges under the sea (immersion), reaches a foreign land (transportation), is taken prisoner (being caught up in a story, being a *captured* audience), and loses contact with all other realities (being lost in a book)" (pg. 93). The reader on the other side of the story is not

the same person who initially embarked the story, therefore the individual returning to reality is somewhat changed by the experience (Pavić, 1988) (Gerrig, 1993). Ultimately, Grau (2003) reveals, “the principle of immersion is used to withdraw the apparatus of the medium of illusion from the perception of the observers to maximise the intensity of the message being transported. The medium becomes invisible” (pg. 349).

Ryan (2001) breaks narrative immersion down into the following themes:

1) You enter (active embodiment) …
2) Into a picture (spatiality of the display) …
3) That represents a complete environment (sensory diversity)
4) Through the world of the picture is the product of a digital code, you cannot see the computer (transparency of the medium)
5) You can manipulate the objects of the virtual world and interact with its inhabitants just as you would in the real world (dream of a natural language)
6) You become a character in the virtual world (alternative embodiment and role-playing)
7) Out of your interaction with the virtual world arises a story (simulation as narrative)
8) Enacting this plot is a relaxing and pleasurable activity (VR as a form of art)” (pg. 51).

Three forms of immersion were identified by Ryan in relation to narratives. These are, spatial, temporal, and emotional. Collins (2013) reveals that the video game *Papa Sangre* (2010) involves limited visuals that are solely used to allow the player to navigate through the soundscape, which creates a spatial environment for players to explore. Naturally, spatial immersion occurs when the game-world produces spatial uncertainty, because there is a level of unfamiliarity for the player that is feeling their way around the virtual environment. Alternatively, in massively multiplayer online video game *PlayerUnknown’s Battleground* (2017), players that occupy houses within the safe zone will semantically listen out for sounds occurring outside of the house to create a spatial understanding of the events taking place

beyond their visual ability. Audible events, for example, enable the player to anticipate an enemy seeking to enter the occupied house, and lack of audible events can signal no immediate threat for the player that is seeking to leave the house. Temporal immersion arises as a consequence of suspense, and increases when the possible outcomes for a player decreases. However, uncertainty of outcome does not always result in immersion. Often a player can feel lost or get stuck in the narrative of a video game, which can cause the player to save the game and quit as a result of frustration. In *Fortnite* (2017), the player is signalled by a sounding alarm to move when the safe zone changes location, and to avoid the storm the player must travel towards the circle to get within the safe zone. The player will die if they do not reach the safe zone in the allocated amount of time, which can be a fairly humiliating death in a game that is driven by gunfire, particularly when a lengthy period of time has been invested into the game. The anticipation of death encourages temporal immersion. Carroll (2001) states, “uncertainty is a necessary condition for suspense. When uncertainty is removed from a situation, suspense evaporates” (pg 72). Nevertheless, intentionally removing sounds from a segment of gameplay that assist to produce suspense does not necessarily evaporate uncertainty, because the future will always be uncertain. A player’s uncertainty will move onto the next thing, such as a quest, a boss battle, or finding loot items, and since all games are fundamentally puzzles, lack of suspense may result in an uncertainty of the uncertain. For instance, lack of sound after defeating an enemy may imply safety, or that there is nothing left for the player to do in a particular area, which can generate a sense of ambiguity with regards to what is expected of the player beyond that moment. As Newmann (2013) suggests, “failure is an essential feature of both games and learning.” (pg. 4), and the awareness of failure in a video game drives the player to continue their state of play. It could be argued that what is learned to succeed within the game is reflected on away

from the screen, and the new skills learned are approved and applied to reality. This permits the player to understand more about themselves through in-game actions. Emotional immersion is the level of emotional involvement a player has with the video game. For instance, the character Master Chief in the *Halo* series is perceived to carry the outcome of the entire human race on his shoulders, which causes the player to empathise with the character whose actions they control. This emotional affect is enhanced by Master Chief's holographic sidekick Cortana; the voice of reason that internally speaks to Master Chief, and the relationship portrayed between the two characters may be applied to the interaction observed between the player and Master Chief, or between the player and themselves.

Two types of immersion were identified by Donnelly, Gibbons, and Lerner (2013), which are diegetic, and non-diegetic. Diegetic immersion refers to the player's involvement inside the video game world, whereas non-diegetic immersion refers to the level of enjoyment the player is experiencing when they are playing the game. It could be argued that wearing headphones during gameplay increases the experience of diegetic immersion because the player is entirely involved in the soundscape of the game-world and is more capable of avoiding external real-world sounds. Additionally, non-diegetic immersion may be dependent on the level of passion that the player brings to the game and how much the player chooses to engage with the game (Ryan, 2001). For instance, first impression reviews and early video game trailers are important tools that can be used to captivate the gamer market before the release of a video game, and a player that uses websites such as *IGN* (1996-2018) to determine the success of a video game may find themselves more/less likely to be willingly involved in the virtual experience. As Crawford (2012) informs, "sometimes video gamers can

be ‘engaged’ with an activity, but not necessarily immersed in the game, such as when a video gamer has to repeat a task to complete a game goal” (pg. 95).

Crawford suggests an alternative approach, recognising that there are two types of immersion that individuals experience; perceptual and psychological. Perceptual immersion is sensory, and the external environment surrounding an individual contributes to the level of immersion experienced, though psychological immersion is the emotional and mental immersion experienced by the individual in accordance with the stimuli they are exposed to. Therefore, immersion can be considered an internal experience (psychological) of the external world (perceptual) (Blesser and Salter, 2009). Ryan (2001) suggests that an engaged reader will carry their beliefs and ideologies to the unfolding story, likewise players in massively multiplayer online video games will carry their beliefs and ideologies to the game-world and project them onto the avatar. However, Donnelly, Gibbons, and Lerner (2014) explain that the state of immersion can be broken if they feel do not feel connected to the avatar, which can help to recognise why gaming series, such as *Grand Theft Auto* (1997 – 2013), are not universally popular and cause controversy because not everyone can identify or wants to identify with an avatar that is required to endure violence towards other human beings in a real-world setting. On the contrary, the Halo series (2001 – 2015) uses violence against alien species to protect the human race, which is more likely to be welcomed by society.

Headphones can help to eliminate external sounds from the real world, enabling the player to hear the virtual environment more exclusively, which extends the ability of the player to listen to sounds in a semantic listening mode and improve their overall gameplay

performance. Using Chion's (1990) three modes of listening, it could be suggested that there are three levels of immersion players experience when listening to in-game sound. Casual, semantic, and reduced immersion. Using PlayerUnknown's Battleground (2017) as an example, casual immersion refers to the state of mind of a player when perceiving the stimuli directly, such as moments of combat, which is comparable to perceptual immersion as suggested by Crawford (2012). Semantic immersion involves moments when the player occupies an abandoned house and listens to nearby sounds to locate events taking place beyond their vision, comparable to psychological immersion (Crawford). And reduced immersion may refer to newly experienced gameplay that the player is unable to identify, therefore not knowing how to react to the stimuli.

2.3.1. Presence

Presence has been described as a subjective feeling of being inside the virtual environment (Slater and Wilbur, 1997), and video games can be considered experiences of presence because the player will often feel as though they are in the game, rather than controlling, manipulating, or even playing the game (Newmann, 2013). As Ryan (2001) explains, "presence, in the VR world – relates to physical presence as virtual reality relates to reality" (pg. 66), and a greater perceived sense of presence within these video games requires improved audio, visuals, and game mechanics to achieve a comparable representation of reality within the virtual game world. Individuals can experience presence on different levels with the same virtual reality system, and the same user can experience different levels of presence during a single gaming session depending on their state of mind and external factors effecting the user (Bowman, McMahan, 2007).

Bowman and McMahan (2007) make a clear distinction between immersion and presence, and explain that,

> many successful applications of immersive VR depend on high-fidelity sensory stimuli with the goal of producing a realistic experience that effectively places the user in the simulated environment. In other words, these applications require a high level of immersion because they produce a sense of presence. The "Immersion and Presence" sidebar further describes this concept

The goal for virtual reality system developers is to reduce the perceptual gap between fantasy and reality, and as virtual reality systems advance, to support immersion sound will become a greater critical feature than it is today, which will allow players to navigate through the virtual environment more naturally. Ryan (2001) identifies that, "we could not feel immersed in a world without a sense of the presence of the objects that furnish it, and objects could not be present to us if they weren't part of the same space as our bodies" (pg. 68). The visual stimuli in virtual reality headsets is viewed by the user inches away their vision, which is likely to generate a greater sense of presence. To balance the visual sense of presence with aural presence, it may be reasonable to suggest that by placing the listener inside the soundscape of the game environment through wearing headphones aural presence can be enhanced, which will augment the state of immersion the player experiences.

2.3.2. Interactivity

Ludologists describe interactivity as the involvement of a player as more than a spectator (Donnelly, Gibbons, and Lerner, 2014) because the player determines the events in the game

(Juul, 1999), and there are different levels of interactivity that a player will experience, which can depend on the player's skill, their state of mind, and the passion they take into the virtual world (Ryan, 2001). For instance, in massively multiplayer online video games, an experienced player may be more capable of interacting in the virtual world than a new player that is still learning the controls, which enables the experienced player to feel a degree of control inside the virtual world, encouraging greater involvement and a greater immersive experience. The level of involvement a player has in a video game is based on how well the player communicates with the machine through the controller and how capable the player is at directing the machine to perform what they want to do in the virtual world. As Vorderer and Bryant (2006) argue,

> we should consider interactivity as a *perceived* characteristic of a communication *act*, which varies according to a communicating actor's perception. That is, interactivity is not just a given characteristic of a particular medium or a communication setting but a constructed characteristic of a communication act according to an individuals' perception." (pg. 263).

Interactivity requires communication between two individuals (Vorderer and Bryant, 2006), or in the example of video games, a person and a machine, which can change how the player engages and immerses themselves in the gameplay experience (Collins, 2013).

Ryan, (2001) explains, "meaningful interactivity requires a compromise between range and mapping and between discovery and predictability. Like a good narrative plot, VR systems should instil an element of surprise in the fulfilment of expectation" (pg. 69). It is suggested by Crawford (2012) that for a player to identify a video game narrative, interaction should be viewed more than a process of communication between sender and receiver, where meaning

is revealed by the active participation of the player interacting with the game environment (Newmann, 2013). It is clear that games require more interaction from the perceiver than other forms of media. However, there is still a level of interactivity in film and television, just as much as there is in a book. For instance, when watching a film at home there is the ability to rewind missed dialogue and fast forward an already seen or boring segment, which requires the perceiver to interact with the remote. Comparable to reading a book, the reader has the option to reread a misunderstood passage or skip read until the next interesting event. The user has control and therefore obtains the ability to interact with the virtual or textual media. Of course, gaming is a different form of interaction because the interactivity can change the course of events during gameplay, although this does not mean that research into virtual and textual media cannot be applied somewhat towards the understandings of video game experiences. Moreover, during virtual reality headset use, it could be advised for researchers to recognise that both the mind and the body are in control of the virtual environment. Collins (2013) declares that, “interacting with sound encourages bodily engagement with games” (pg. 88), which encourages new listening practices and ensures that gameplay is appealing and immersive (Donnelly, Gibbons, and Lerner, 2014). Collins recognises three categories of sounds that are triggered through interactivity, which are; interactive, adaptive, and dynamic. Interactive audio involves sounds that are triggered by the actions of the player, adaptive audio refers to sounds that are reacting to the game environment, and dynamic audio incorporates the two (Donnelly, Gibbons, and Lerner, 2014). For instance, interactive audio allows the player to respond to the stimuli appropriately and can improve their gameplay performance if the sounds are listened to attentively (Collin, 2013), which could help to explain why headphones are an increasingly popular way to listen to sound during gameplay.

2.3.3. Flow

Csikszentmihalyi (2014) explains that games become enjoyable when:

> (a) a person is able to concentrate on a limited stimulus field, (b) in which he or she can use his or her skills to meet clear demands, (c) thereby forgetting his or her own problems, and (d) his or her own separate identity, (e) at the same time obtaining a feeling of control over the environment, (f) which may result in a transcendence of ego-boundaries and consequent physic integration with metapersonal systems (pg. 135).

Csikszentmihalyi's research into the concept of flow declares people are often happiest when they are entirely engaged with an activity, permitting them to escape negativities that are present in their current lives. Flow "*is a subjective state that people report when they are completely involved in something to the point of forgetting time, fatigue, and everything else but the activity itself*" (pg. 230). It enables an individual to escape the everyday and supress one's worries about their career, relationship, friendships, etc., causing those under its affect to witness a perceived loss of time that is usually noted in activities where the individual is totally immersed. However, Welsh (2006) argues, "though one cannot escape the everyday, at the level of practice, one can at least play it as one chooses." (pg. 141). Subjects naturally experience a lack of anxiety about losing control of their environment, particularly during hazardous activities that require more concentration and skill, such as rock climbing, mountain biking, and hang gliding (Csikszentmihalyi, 2014, pg. 227-232). The brain completely focuses on the task ahead, which enables the individual to put aside their worries, therefore making the activity intrinsically rewarding. Two conditions must be met before entering flow, (1) a matching of challenges or action opportunities to an individual's skill, and (2) clear and close goals with immediate feedback about progress (Nakamura and Csikszentmihalyi, 2002).

Based on Csikszentmihalyi's findings, players continuously evaluate their gaming experience and will either decide to endure or dismiss the activity upon reflection. If the player continues play, they will eventually enter a state of flow and may find themselves totally immersed. However, Zhai (1999) argues that, "our egos are very important to us and we really separate ourselves off from the environment and from the overall flow of life. What'll happen is that in virtual reality we'll recreate the flow. The flow anywhere is the same flow, so the flow that we create in virtual reality will be a new flow but it's also part of the same eternal flow" (pg. 187).

Newfound experiences can encourage an individual to continue their interest in an activity in search of new discoveries that are intrinsically rewarding. This behaviour has been identified by Csikszentmihalyi (2014) as *emergent motivation*, which, in video games, may become prominent when the game mechanics, graphics, map exploration, sound design, etc. are independently unique or unfamiliar, enabling the player to invest time to fulfil their curiosity. Implementing original sound libraries in video games will maintain further player engagement because they are unfamiliar with their acoustic surroundings, which can urge the continuation of exploration in the game's environment. The flow experience can encourage players to immerse themselves in the games they are playing, where the sole act of playing defines the immersive quality of a game, known as "immersive fallacy" (Salen and Zimmerman, 2003). Immersive fallacy is:

> the idea that the pleasure of a media experience lies in its ability to sensually transport the participant into an illusionary, simulated reality. According to the immersive fallacy, this reality is so complete that ideally the frame falls away so that the player truly believes that he or she is part of an imaginary world (pg. 450).

Virtual reality headsets produce a greater sense of presence because the user feels transported into the virtual world, therefore increasing the likelihood for the player to experience immersive fallacy. It could be suggested that when immersive fallacy takes place and the frame falls away from the screen, the player believes to a degree that they are part of the virtual world and act as themselves through the avatar they control.

2.4. Research Questions

Specific questions raised in this thesis are: Why do some players choose to use headphones over external speaker systems in video games? Do players consider that headphones affect their attentive listening during gameplay? How do players use headphone interaction with sound to impact their gameplay performance? Why do headphones enhance immersion? Do players acknowledge that headphones can provide a greater experience of immersion? Are headphones used for any other unknown purposes? And can insufficiently researched areas on immersion during gameplay experiences be identified for future studies?

3. Methodology

Immersion is an individual internal human experience of the external world (Blesser and Salter, 2009), which is most prominent when the individual focuses their entire attention on one activity. Concepts of immersion are gaining interest in scholarly research that helps to explore understandings on immersion and recognise how immersive experiences can be augmented by emerging new technologies. Ryan (2001) claims that the term immersion, "has become so popular in contemporary culture that people tend to use it to describe any kind of intensely pleasurable artistic experience or any absorbing activity" (pg. 14). Video games are designed to encourage an immersive, engaging and entertaining experience, which enables the player to forget about their immediate surroundings and commit themselves to the virtual environment (Jennett, Cox, Cairns, Dhoparee, Epps, Tijs, & Walton, 2008). An immersive video game is considered to be successful when it enables the player to deny their external environment and express themselves inside the game world. When individuals are immersed they are less likely to recognise passing time and will spend a longer duration inside the virtual game world, which appears to be the ultimate objective for video game developers today that aim to attract and impress their audiences and the gaming community.

Virtual reality technology companies are working to improve the sense of realism inside virtual reality systems that can offer a greater sense of presence, causing the player to feel more involved in the game environment. Bowman and McMahan (2007) explain, "compared to console gaming, gaming in immersive VR is effective because it provides a more realistic experience, even though the virtual world may not simulate an actual real-world location" (pg. 37). To enhance realism, virtual reality technology developers are applying features such

as facial expressions and body language to promote voice chat and communication between players. For instance, neuroscience and computing company MindMaze are currently developing a virtual reality headset, *MASK* (2017), that aims to synchronise player emotions from the real world into the virtual world, applying neuro-VR technology to detect the facial expressions of a player using electrical impulses that can predict an expression 20 to 30 milliseconds before it happens (Robertson, 2017) (Lang, 2017). This technology allows the user to emotionally react to the gaming environment more naturally, which could make it easier for players to perform their personalities through the avatar in the virtual world (Crawford, 2012). Additionally, it makes the social experience more realistic for others sharing the virtual environment because they are able to observe emotional reactions from other players directly.

Pioneering company Virtualise (2012) were invited to the WIRED2015 Test Lab event in London and created the virtual reality system *The Cell* (2015) to push the boundaries of VR technology, enabling players to interact using their entire bodies. As Grau (2003) explains:

> The technological goal, as stated by nearly all researchers of presence, is to give the viewer the strongest impression possible of being at the location where the images are. This requires the most exact adaptation of illusionary information to the physiological disposition of the human sense (pg. 14).

The project lasted three months and the team “worked to deliver a VR game with low latency, high quality, photo real, graphics to give each participant a sense of presence, allowing complete and comfortable immersion in the future" (Visualise, 2015). Within virtual reality

systems, narratives are less likely to be an essential part of the player experience because users will independently create their unique narratives when interacting with a game's environment due to a greater sense of presence (Ryan, 2001) (Slater and Wilbur, 1997). This is observed in all online first-person-shooter video games, where the demand for storylines that are typically driven by suspense, identified as *temporal immersion* (Ryan), are less significant because the players create narratives through action, therefore scripted narratives are less important when determining the success of such video games, as is the case for virtual reality systems that generate a strong sense of presence. Crawford (2012) reminds researchers that,

> though it is probably fair to say that video games were once a relatively under-researched area, certainly in comparison to other entertainment industries and forms, such as cinema and music, since the early to mid-2000s, interest in and research on video games and gamers have risen significantly (pg. 1).

In the last 5 years, the global video game industry has increased its total revenue by $20bn, to $75bn, and the overall number of players is estimated to be 1.8 billion (Statista, 2016) with one in three people identifying as gamers in the UK (Newmann, 2013). Video games are now over 60 years old, with the earliest example alleged to be *Tennis for Two* (1958) (Newmann). Today, more contemporary research is acknowledging the social, cultural, political and economic significance of video games, in addition to an increasing appreciation for the role of diegetic sounds in gameplay experiences that are used to guarantee continual engagement (Newman, 2013) (Donnelly, Gibbons, and Lerner, 2014 pg ix). The methodology in this thesis intends to draw current understandings from the researched literature on the concepts of immersion, which are applied to offer a foundation for investigations into how immersive player experiences are impacted when using headphones as a preferred audio device.

3.1. Research Aims

This research focuses on understanding the impact of immersion during gameplay experiences, which is defined by Murray and Jenkins (n.d.) as “the pleasure of being transported to another place, of losing our sense of reality and extending ourselves into a seemingly limitless, enclosing, other realm” (pg 2). The purpose of the research is to uncover areas of study that may require greater focus where additional knowledge could benefit current understandings on immersion in virtual reality systems, and how listening to sound through headphones in video games augment the immersive player experience. The survey also explores the significance of using headphones during gameplay and outlines the reasons why players generally choose to use headphones as a preferred listening device.

3.2. Research Method

The proposed research method is intended to be both reliable and valid. Bell (1999) describes reliability as, “the extent to which a test or procedure produces similar results under constant conditions on all occasions”, and validity as, “whether an item measures or describes what it is supposed to measure or describe” (pg. 103-104).

According to Bell, surveys are generally used to obtain information that can be analysed and used to make comparisons to provide conclusions. In addition, they “obtain information from a representative selection of the population and from that sample will then be able to present the findings as being representative of the population as a whole” (Bell, 1999, pg. 13-14). Cohen, Manion, and Morrison (2011) explain that, “a survey has several characteristics and

several claimed attractions; typically, it is used to scan a wide field of issues, populations, programmes, etc. in order to measure or describe any generalised features" (pg. 256). Surveys are selected to obtain information so that patterns and comparisons can be extracted from the collected data (Bell), which Cohen, Manion, and Morrison, suggest are useful for, "gathering factual information, data on attitudes and preferences, beliefs and predictions, opinions, behaviour and experiences – both past and present" (pg. 257).

Surveys can be exploratory where relationships and patterns can be explored, and also confirmatory, where the responses can be used to test a hypothesis (Cohen, Manion, and Morrison). They are useful for answering questions What? Where? When? And How?, however, they struggle to uncover why the respondent answers in a particular manner (Bell). Accordingly, an open-ended question may be suitable to allow respondents to provide answers that explain why they responded in a particular way.

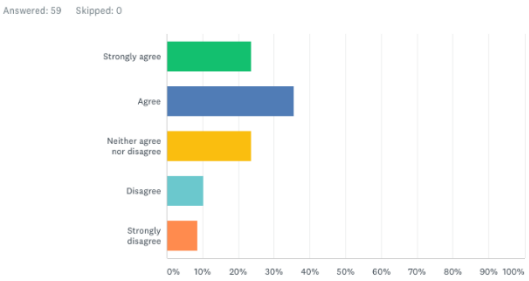
3.3. Research Procedure and Data Collection

To recognise why a player chooses to use headphones for video game purposes, gaming communities have been contacted via several online gaming forums to ask respondents to fill out the survey. The closed-ended questions provide quantitative data and are structured so that the respondents can either agree or disagree with the prompting questions. In addition, the responders are permitted to provide qualitative data by answering to an open-ended question in detail to reveal the specific reasons why they select headphones for gameplay experiences.

4. Findings

The empirical findings in this research includes quantitative and qualitative data that are analysed individually. Comparisons are drawn and conclusions are presented, which aim to provide a broader understanding on the immersive player experience that can be enhanced using headphones. The quantitative data is used to identify why players generally prefer to use headphones for video gaming purposes, and the qualitative data will be used to analyse user responses in more detail, which are unpacked in the form of a discussion. The survey includes responses from 59 video game players that have experience using headphones during gameplay. The results largely represent the male gaming community (92% male, 5% female), and the majority of respondents were between the ages of 25 and 34 (40%). The quantitative data are unpacked independently and are used to reveal associations between responses. The qualitative data involves ten core reasons that identify why consumers use headphones for gameplay experiences, which are unpacked and discussed using selected quotations from respondents to present a broader understanding why headphones are used during gameplay. The appendix can be referred to for additional responses (qualitative data) that may provide a greater understanding that explains why headphone use is an increasingly popular trend today (Yin-Poole, 2018).

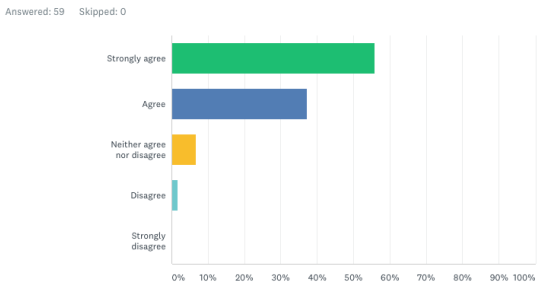
4.1. Quantitative Data Analysis



ANSWER CHOICES	RESPONSES	
Strongly agree	23.73%	14
Agree	35.59%	21
Neither agree nor disagree	23.73%	14
Disagree	10.17%	6
Strongly disagree	8.47%	5
Total Respondents: 59		

Figure 1. Do you use headphone for video games to eliminate sounds from the real world?

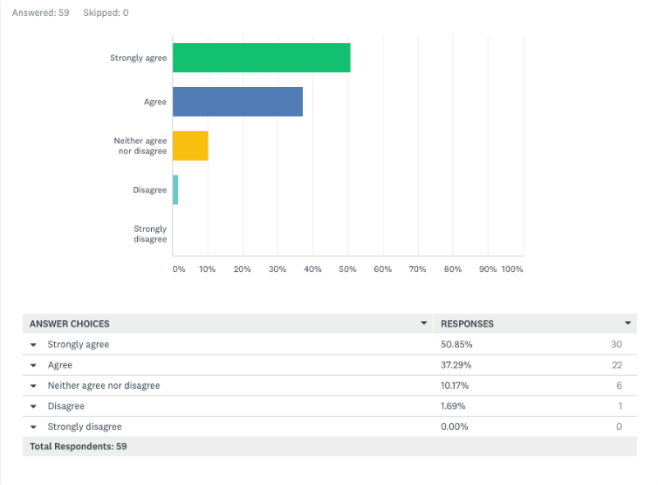
In total, most respondents (59%) agree that they use headphones to block out external audible distractions, although the results suggest that it is not a fundamental reason for using headphones. 19% of respondents disagree, and it is feasible to assume that they are less concerned about external sounds effecting their gameplay experience. In addition, it could depend on the genre of game they are playing. For instance, competitive games may be more suitable for isolated listening through headphones because it enables the player to indicate where other surrounding players are (spatial awareness).



ANSWER CHOICES	RESPONSES	
Strongly agree	55.93%	33
Agree	37.29%	22
Neither agree nor disagree	6.78%	4
Disagree	1.69%	1

Figure 2. Can you hear sounds that you would otherwise not notice when using headphones for video games?

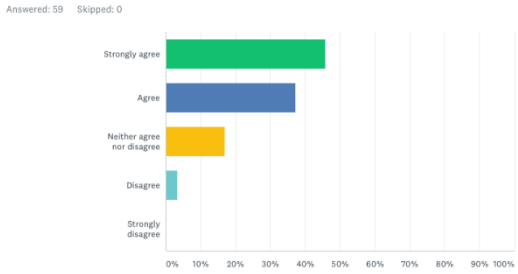
Most (83%) respondents agree that they are capable of hearing less noticeable sounds through headphones during gameplay, including 56% of respondents that strongly agree. These may include sounds such as footsteps that can help to enhance a player's audible perception, which can improve the gameplay experience. Only one respondent disagrees, suggesting that respondents are aware of the benefits of wearing headphones to achieve a greater sense of presence.



ANSWER CHOICES	RESPONSES	
Strongly agree	50.85%	30
Agree	37.29%	22
Neither agree nor disagree	10.17%	6
Disagree	1.69%	1
Strongly disagree	0.00%	0
Total Respondents: 59		

Figure 3. Do you feel more involved in a game's environment when using headphones for video games?

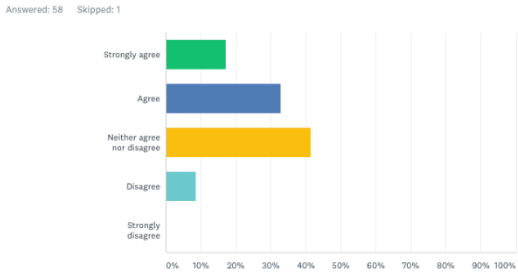
Nearly all respondents (88%) agree that they feel more involved in the game environment when wearing headphones. This supports the previous suggestion that headphones may produce a greater sense of presence because the player is likely to feel more present in the game world. One respondent disagrees, which may indicate the headphones they are using lack comfort, or the respondent plays video games where feeling more involved is not so crucial. Moreover, it may suggest that the respondent is generally more comfortable using external speakers that enable them to enjoy the gameplay experience, therefore feeling more involved.



ANSWER CHOICES	RESPONSES	
Strongly agree	45.76%	27
Agree	37.29%	22
Neither agree nor disagree	16.95%	10
Disagree	3.39%	2
Strongly disagree	0.00%	0
Total Respondents: 59		

Figure 4. Do you feel more focused during gameplay when using headphones for video games?

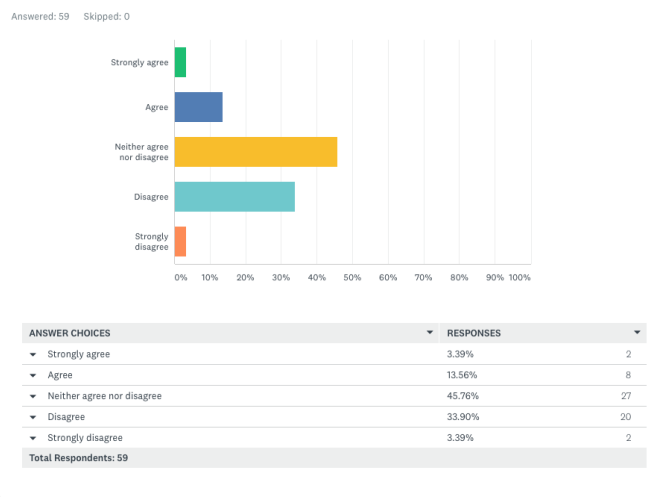
Most (83%) respondents agree that they feel more focused when wearing headphones during gameplay. The isolation from the player's exterior environment may enable them to provide a greater level of attention to the objectives presented in the video game.



ANSWER CHOICES	RESPONSES	
Strongly agree	17.24%	10
Agree	32.76%	19
Neither agree nor disagree	41.38%	24
Disagree	8.62%	5
Strongly disagree	0.00%	0
Total Respondents: 58		

Figure 5. Do you feel an improvement in gameplay performance when using headphones for video games?

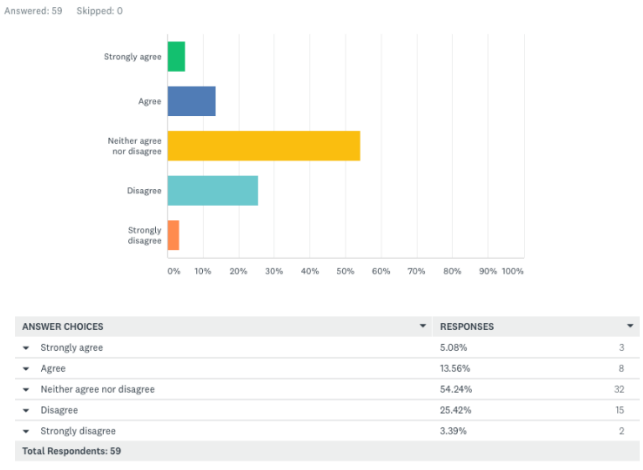
Half of the respondents (50%) agree, though many respondents (41%) were unsure how to answer, which is most likely because they are incapable of identifying their own gameplay performance improvements. However, if respondents agree that they can focus better during gameplay and can hear sounds they would otherwise not be capable of noticing when using headphones, then it is likely that their gameplay performance will improve.



ANSWER CHOICES	RESPONSES	
Strongly agree	3.39%	2
Agree	13.56%	8
Neither agree nor disagree	45.76%	27
Disagree	33.90%	20
Strongly disagree	3.39%	2
Total Respondents: 59		

Figure 6. Do you feel that in a gaming session your duration of play increases when using headphones for video games?

The majority of respondents (46%) were unsure how to answer and the remaining respondents mostly disagree (38%). This is likely due to other varying factors that may impact the player's duration of gameplay (routine, responsibilities). However, it may indicate that future research in the form of a primary research experiment could be used to measure the differences of engagement between external speaker users and headphone users.



ANSWER CHOICES	RESPONSES	
Strongly agree	5.08%	3
Agree	13.56%	8
Neither agree nor disagree	54.24%	32
Disagree	25.42%	15
Strongly disagree	3.39%	2
Total Respondents: 59		

Figure 7. Do you feel that time passes quicker when using headphones for video games?

Over half of the respondents (54%) were unsure how to answer. However, if respondents agree that headphones can produce a greater level of focus and a greater sense of presence,

then it may be reasonable to suggest that the player will be more immersed in a game environment with headphone. During this experience, the player enters the state of flow (Csikszentmihalyi, 2014) and are therefore less capable of acknowledging passing time.

4.2. Qualitative Data Discussion

A thematic approach (Braun and Clarke, 2006) aimed to discover similarities and comparisons between responses, which are used in the data analysis to identify categories that outline reasons why headphones are a preferable audio device. Some respondents have written detailed and interesting answers that spread over a few categories. Nine categories were identified

Knowingly enhance immersion – 24 responses

“The depth of audio pumping directly into your ears creates a far more engaging and immersive experience.”

“In more creative and explorative games I enjoy wearing headphones as I get more involved in the world I’m playing in.”

“I tend to spend a lot on a really good set of headphones and it really is a pleasure to listen to games through them at high volume, enhances the whole experience.”

“Because it lets me forget about the world around me to give all of my attention to the game.”

Tentative listening – 18 responses

“I notice quieter sounds that I wouldn’t otherwise hear over external speakers, which can help with immersion, even something as simple as the sound of the wind or a house creaking.”

“Some games are better with headphones if you can use them to give you an advantage (like footsteps in FPS MP games) and others it’s not so important.”

“[If] it is a competitive game where I need to hear enemy movement.”

“I believe it makes it easier in multiplayer games to hear footsteps from an opposing team, if you’re hiding and their looking at you, it may be easier to hear a door open or footsteps on a wooden floor or the crunching of snow.”

Concern for others in external environment – 18 responses

“I can game at a suitable volume, during the day or night without disturbing anybody else.”

“I play in a communal area. I use headphones so that others do not need to hear my game.”

“I have young children so often I can’t play using speakers at a volume level I’m happy with.”

“In a situation where there was a lot of background noise which would cause disruption to the game, then wearing headphones could be a solution.”

Block out the external environment – 14 responses

“Stops me from getting distracted by other people in my house, breaking my immersion.”

“No background noise to flush out all the sounds from the game.”

“Using a set of headphones for gaming means I am fully shut off from external distractions.”

“I now prefer wearing headphones at any time of the day because it drowns out external sounds and better clarifies the sounds in game.”

Knowingly improve gameplay performance – 11 responses

“To improve gameplay through sounds not normally heard.”

“In competitive games where sound gives you an edge (pubg).”

“Sounds can be a lot more accurate when wearing headphones – this improves the way I play in some online games where sound is vital to hearing other players.”

“Helps with concentration when playing a competitive online game.”

Casual gaming requires casual listening, so players will use external speaker systems. Competitive gaming requires semantic listening, so players will use headphones to listen to sounds more tentatively.

Spatial awareness – 11 responses

“Can hear people sneaking up behind you, hear where people are shooting at you from more accurately.”

“Directional sound for shooters.”

“3D positioning of sound sources, i.e. more realistic directionality to sound.”

“Surround sound helps me play. Whether it’s hearing where a shot is coming from or listening to where the croaking of frogs I’m collecting are, it’s very helpful and immersive.”

Social interactions and online communication (team chat) – 5 responses

“I find them essential, but as a communication tool i.e. teamspeak etc.”

“I only use headphones when I’m playing multiplayer and need to communicate with teammates.”

“Headphones often include a microphone, which has been a great addition for speaking and noise features through titles like Alien Isolation and Dead Rising 3.”

To enhance the narrative – 4 responses

“I play games to be taken away from my current surroundings and to be swept by the stories and worlds that these companies created.”

“Basically, to eliminate external sounds and to have the best quality experience when playing a game for the first time (particularly cinematic, story-driven games).”

“It allows me to become more immersed when playing a story-driven single player game.”

Personal circumstance – 2 responses

“Because I am unilaterally deaf (80% loss) and the only way I can hear the game is if I’m using headphones.”

Additional reasons

The preference for wearing headphones can depend on the genre of the game, for instance, some respondents note that horror games intensify the listening experience. It could be proposed that the greater sense of presence through wearing headphones helps to place the player inside the game, causing them to listen more tentatively. Therefore, the sounds will have a more significant impact on the player during gameplay. Some respondents report using headphones for shorter and more intense gameplay. However, they will use external speakers for more casual gameplay. For example, one respondent explains, “I do find that wearing headphones can make gaming a more intense experience, which is why I play in shorter sessions when using headphones and don’t use them when replaying older games or playing for relaxation”, and another stating, “sometimes I prefer not to game for long hours with a headset on for comfort”.

Other players avoid using headphones where possible due to a lack of comfort and/or the feeling of being isolated from the real world, though this could depend on the quality of the headphones. Several responses have been included as seen below.

Avoid headphone experiences – 9 responses

"I have a wife and small children and prefer to game without headphones so I can hear what's going on around me."

"I have done most of my gaming without headphones and through a set of speakers. I feel most comfortable when using external speakers for video games and so therefore can enjoy the game to its fullest."

"Sometimes I find headphones to be quite isolating. I choose speakers for long amounts of gameplay."

"I find it more distracting to have my external environment blocked out."

"I find them a bit claustrophobic."

"Sometimes I prefer not to game for long hours with a headset on for comfort."

4.3. Limitations and Observations

The queries in this survey may be viewed as leading questions. However, participants were permitted to agree or disagree using their own judgement, and the results suggest that the respondents answered the questions honestly. It could also be argued that there are not enough respondents for there to be a representative sample of the gaming community, in particular the female audience.

On reflection, the survey is aimed at users by choice, which became apparent when receiving feedback from respondents that suffered from unilateral hearing loss. For these users,

headphones are essential for the listening experience in video games, which enables them to play the sounds at a volume level that they are most comfortable with. Finally, the survey may have benefitted by directing the survey towards competitive gamers to provide mental boundaries for the respondents when answering the questions. For instance, the findings reveal that players find sounds in competitive video games more important for headphone use because they use tentative listening and spatial awareness to benefit their gameplay performance and experience.

5. Conclusion and Further Discussion

In summary, sounds obtain the ability to induce emotions (Bergman, Västfjäll, Tajadura-Jiménez, and Asutay, 2016), and emotions obtain the ability to colour our perception of time (Droit-Volet and Meck, 2007), therefore it may be reasonable to suggest that emotional reactions to stimuli are naturally occurring internal (psychological) experiences of immersion that are triggered through the use of gameplay sounds. It is apparent in this research that players acknowledge and use headphones to promote and augment the immersive experience for a number of reasons. These include, but are not limited to: isolation from exterior sounds in the real world; tentative listening leading to greater concentration in the game world; improved spatial awareness; social interactions; and superior emotional engagement or involvement in story-driven video games. Furthermore, for some users, headphones are an essential requirement for those that suffer from unilateral hearing loss because it personalises the listening experience (adjust audio without disturbing others). Lastly, some players prefer to use headphones for shorter durations of gameplay because it produces an intensified immersive experience that can be overwhelming in, for example, survival horror video games.

Additional research could help to identify and measure the perceived loss of time that players experience during gameplay, which could be used to compare the differences between headphones and speaker systems. The final thoughts drawing from the literature in this thesis, using Chion's (1990) three modes of listening and the qualitative data from the survey,

it could be suggested that players may use casual listening more commonly for external speaker systems, whereas semantic listening may be more commonly used for headphones.

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Appendices

Questionnaire:

Video game headphone users: How do you interact with sound?

Q1) What is your gender identity? (Please circle your answers)

Male Female Other Prefer not to say

Q2) What is your age?

Under 18 18-24 25-34 35-44

45-54 55-64 65+

Q3) Do you use headphone for video games to eliminate sounds from the real world?

Strongly agree Agree Neither agree nor disagree Disagree

Strongly disagree

Q4) Can you hear sounds that you would otherwise not notice when using headphones for video games?

Strongly agree Agree Neither agree nor disagree Disagree

Strongly disagree

Q5) Do you feel more involved in a game's environment when using headphones for video games?

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Q6) Do you feel more focused during gameplay when using headphones for video games?

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Q7) Do you feel an improvement in gameplay performance when using headphones for video games?

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Q8) Do you feel that in a gaming session your duration of play increases when using headphones for video games?

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Q9) Do you feel that time passes quicker when using headphones for video games?

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Q10) In your own words, why do you choose to listen to sounds through headphones over external speakers when playing video games?

……

……

……

……

Qualitative Responses (Q10)

“A courtesy to others in the household.”

“Good stereo headphones are more immersive for the price than a speaker setup. 2. Headphones are less disruptive to others in the household, and block out external sound better than speakers.”

“To block outside noise. Plus, I am a little bit deaf.”

“To talk to teammates mainly.”

“The depth of the audio pumping directly into your ears creates a far more engaging and immersive experience. In addition, games like Hellblade: Senua's Sacrifice need proper headphones to get the full effect of the game. Finally, headphones often include a microphone, which has been a great addition for speaking and noise features through titles like Alien Isolation and Dead Rising 3.”

“Better immersive experience.”

“Immersion and Clarity of sounds. Always found it gives me an edge.”

“Certain sounds are easier to here with headphones. I'm a competitive gamer when it comes to most online games, so I want to have the best equipment possible so I can perform the best I can. Plus, I live with people, and I don't have to worry about disturbing them.”

“To block out noises in my environment as well as for gaming at night so I don’t disturb others.”

“More immersive. I notice quieter sounds that I wouldn't otherwise hear over external speakers, which can help with immersion, even something as simple as the sound of the wind or a house creaking. Stops me from getting distracted by other people in my house, breaking my immersion. Can also be beneficial in competitive multiplayer, can hear people sneaking up behind you, hear where people are shooting at you from more accurately.”

“Immersion, but I only use headphones when I'm playing competitively. If I'm playing a single-player I prefer external speakers.”

“No background noise to flush out all the sounds from the game.”

“Immersion. I play games to be taken away from my current surroundings and to be swept by the stories and worlds that these companies created.”

“I answered on the way I use phones. I find them essential, but as a communication tool i.e. TeamSpeak etc. I need that communication distinct from sound effects. I play sound effects through the speakers. I don’t like closed headphones as I find them a bit claustrophobic rather than immersive. As I play a lot of multiplayer co-op then voice is more important and a good set of phones helps get that communication and social experience where speakers would not. If the environment required it then i.e. very noisy or had to be quiet then I might push everything through phones, but where possible I prefer just voice. It is also less fatiguing.”

“I play in a communal area. I use headphones so that others do not need to hear my game.”

“I only use headphones when I’m playing multiplayer and need to communicate with teammates. I have a wife and small children and prefer to game without headphones so I can hear what’s going on around me, though I can acknowledge the benefits and additional immersion.”

“The way sound is mixed in games can be a lot more accurate when wearing headphones - this improves the way I play in some online games where sound is vital to hearing other players. In more creative and explorative games, I enjoy wearing headphones as I get more involved in the world I'm playing in, not being able to hear real world sounds is very important to the gaming experience in my opinion.”

“I usually prefer to use external speakers on a 2.1 setup. But this can lack the surround sound experience required in some games, and most people do not have the money or space to accommodate this. Using a set of headphones for gaming means I am fully shut off from

external distractions, I can obtain a better level of surround sound/audio space meaning a greater level of immersion, all for a fraction of the cost of a full surround sound setup. This also means I can game at a suitable volume, during the day or night without disturbing anybody else."

"I like a nice binaural feel when I play packman."

"The sound is a lot clearer."

"First, I mostly game at night when the wife is sleeping. Second, I now prefer wearing headphones at any time of the day because it drowns out external sounds and better clarifies the sounds in game. Third, it might help that I use high end equipment. Started off with HD280 Pros, moved up to AD900X Airs, and now use RF 175s."

"To stay quiet for everyone else!"

"To improve gameplay through sounds not normally heard."

In competitive games where sound gives you an edge (pubg) I will usually wear headphones for that exact reason."

"7.1 Surround headset gives way better immersion since I don't own any kind of home-theatre setup."

“Most of the time it's to feel a little more immersion and pick up sounds I may not notice through my speakers. Once in a while it's to block outside noises.”

“A multitude of reasons including immersion for story telling games, directional sound for shooters and sound cues for racing and action games.”

“I have young children so often I can't play using speakers at a volume level I'm happy with. I tend to spend a lot on a really good set of headphones and it really is a pleasure to listen to games through them at high volume, enhances the whole experience.”

“The details you can hear with headphones versus TV speakers is incredible. Being able to hear enemies coming from different directions is helpful for fps games. Hearing single player games through headphones adds greatly to the immersion of the game as well.”

“Better sound quality for me, and nobody else wants to be listening to it.”

“I wouldn't choose to listen to sounds through headphones-only if wearing headphones were an essential part of the games mechanic. Listening to the audio through speakers (stereo or surround sound) whilst playing the game, would keep me engaged. This is most likely because I have done most of my gaming without headphones and through a set of speakers. I feel most comfortable when using external speakers for video games and so therefore can enjoy the game to its fullest. In a situation where there was a lot of background noise which would cause disruption to the game, then wearing headphones could be a solution for this - but I would try to avoid wearing headphones where possible.”

“So that I do not disturb others.”

“Sometimes I find headphones to be quite isolating. I choose speakers for long amounts of gameplay and headphones for games where I really need to pay attention to the sounds.”

“Provides a greater level of immersion, especially for atmospheric games. Survival horror games in particular have a much higher scare factor when wearing headphones due to sudden noises and scary sections having a greater impact with headphones, offering the ability to scare you more so than without headphones.”

“Mostly for convenience. External speakers would disturb other people in my house.”

“So that I don't waken my children.”

“I mostly use them to avoid disturbing my son after bed time. They do provide a different experience to speakers which I do find better. I do prefer to use speakers if I can though, probably because it's an old habit!”

“I believe it makes it easier in multiplayer games to hear footsteps from an opposing team, if you're hiding and their looking for you, it may be easier to hear a door open or footsteps on a wooden floor or the crunching snow. I also use them to drown out day time outside noises like kids hollering and shouting. Makes any games that are supposed to be scary just a little bit scarier since you can hear the intricacies that make a horror game, sound horrifying.”

“The main reason is due to gaming in the evening when the children are in bed. The added immersion is a bonus for most games although there are certain types of games where headphones are essential to the experience, such as horror games.”

“So the neighbours don't hear my friends shouting on TeamSpeak / generally to not disturb the neighbours. I use wireless headphones, Sennheiser RS180. The battery lasts all day so that's not a limitation, but they make my ears warm so I prefer to use speakers over headphones for comfort. Important of sound varies depending on the game. In some games the sound is the difference between life and death (e.g. Counter Strike). In some games the sound isn't even necessary so I mute it (e.g. EVE Online).”

“3D positioning of sound sources, i.e. more realistic directionality to sound.”

“My wife has something on the TV or it is a competitive game where I need to hear enemy movement.”

“Because I am unilaterally deaf (80%loss) and the only way I can hear the game is if I'm using headphones. I also use headphones for TV, movies, and music.”

“Immersion.”

“I turn down the in-game sound and listen to my own music in my headphones.”

“I'm 50/50. I don't always use my headphones, but when I do it's because I don't want to make too much noise in my house with the volume on the television turned up.”

“I only use it for some games like Shooters so i can hear the bullets and footsteps. Otherwise I have one side off of my ear while I use the other side for chat. Also use it for Spotify.”

“I use both as I also use a Surround sound system. Some games are better with head-phones if you can use them to give you an advantage (like footsteps in FPS MP games) and others its not so important. Audio itself is a big component to immersion and sometimes I prefer not to game for long hours with a headset on for comfort - other times its great for advantages or to chat with friends too.”

“It allows me to become more immersed when playing a story-driven single player game and also helps with concentration when playing a competitive online game. Certain sounds are easier to pick up on and it also allows you to block out distractions from outside the game.”

“The sound quality is better than my TV’s speakers and surround sound helps me play. Whether it’s hearing wear a shot is coming from or listening to where the croaking of the frogs I’m collecting are, it’s very helpful and immersive.”

“Because it lets me forget about the world around me to give all of my attention to the game. I find it easier to get lost in the game because it blocks out external distractions.”

“I would actually prefer to turn up the sound on a nice home theatre system but I live in an apartment so I don't really have that option. Headphones are the next best thing to get good sound for video games.”

“I tend not to as I find it more distracting to have my external environment blocked out.”

“Basically, to eliminate external sounds and to have the best quality experience when playing a game for the first time (particularly cinematic, story-driven games). I do find that wearing headphones can make gaming a more intense experience, which is why I play in shorter sessions when using headphones and don't use them when replaying older games or playing for relaxation.”